DOCUMENT RESUME

ED 075 221 SE 015 889

TITLE	Activities for Studying Rocks and Soil, Grade Level 4-6. Environmental Education Series, Bulletin No. 247-E.
INSTITUTION	Montgomery County Public Schools, Rockville, Md.
REPORT NO	Bull-247-E
PUB DATE	[70]
NOTE	16p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	Curriculum Development; *Elementary Grades; *Environmental Education; *Geology; Instructional Materials; *Learning Activities; Natural Resources; Outdoor Education; *Teaching Guides; Units of Study (Subject Fields)

ABSTRACT

This bulletin is one in a series of environmental education activity guides for grades K-12, developed and field-tested by teachers in the Montgomery County (Maryland) Public Schools. Primarily for use in the middle grades four through six, the guides are not intended to constitute complete units in themselves. They are, rather, a compilation of activities considered appropriate for particular environmental studies. In this guide about rocks and the soil, for grades four through six, activities are entitled: Collecting Rock Samples for Observation and Classification, Testing Rocks for Hardness, Classifying Rocks, Observing the Weathering Action of Water on Rocks, Breaking Down Rocks by Freezing, Demonstrating the Effect of Rainfall on Soil, and Observing the Effect of Moving Water on the Earth's Surface. Each activity includes the instructional objective, procedures to follow, and materials required. Teacher notes are added when necessary. A student evaluation sheet concludes the bulletin. Related documents in the series are SE 015 885 through SE 015 888 and SE 015 890 through SE 015 893. (BL)

ED 075221

Activities for Studying

Rocks and Soil

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MONTGOMERY COUNTY PUBLIC SCHOOLS · ROCKVILLE, MARYLAND · Homer O. Elseroad · Superintendent of Schools

Environmental Education Series · Bulletin No. 247-E

ENVIRONMENTAL EDUCATION
ACTIVITIES FOR STUDYING ROCKS AND SOIL
GRADE LEVEL 4 – 6

Bulletin No. 247-E

Montgomery County Public Schools
Rockville, Maryland
Homer O. Elseroad
Superintendent of Schools

INTRODUCTION

For some time, there has been a need for curriculum materials to assist teachers who wish to move the teaching/learning experience beyond the school walls. Although individual schools have prepared materials useful to their own unique purposes, such information and teaching aids have not generally been shared with other schools.

This series of bulletins on Environmental Education was developed after arrangements were made in Area 11 for approximately a dozen 12-month teachers to produce outdoor education materials during the summer of 1969. Field testing of these materials occurred, primarily in Area 11, during the 1969-70 school year.

In the summer of 1970, an Outdoor Education Curriculum Development Workshop was conducted at Randolph Junior High School, during which twelve teachers developed additional materials and reviewed and tested those prepared earlier.

The bulletins in this Environmental Education series are not intended to constitute complete units in themselves. They are, rather, a compilation of activities considered appropriate for particular environmental studies. Whether the series should be used separately or as a supplement to other aids should be determined by the needs and purposes of each teacher and his students.

A word of explanation about format: Each activity suggested has its own stated instructional objective. The achievement of that objective will be an individual experience for each student, even though in some cases the procedures suggested may be group- rather than individually-directed.

PURPOSE

It is the purpose of these activities to create teacher and student interest in some of the forces changing the surface of the earth, and to observe their effects and determine their causes in the outdoor environment. These activities may be used to learn about the rocks and rock formations found in a particular environment and the effects of the powerful forces wearing away the earth's surface: weathering and erosion. These forces can be seen at work in the immediate environment of most schools and the communities they serve. However, some of the activities involve classroom demonstrations as well as outdoor observations.

TABLE OF CONTENTS

Introduction iii

Purpose iii

Activities:

1. Collecting Rock Samples for Observation and Classification 1
2. Testing Rocks for Hardness 2
3. Classifying Rocks 3
4. Observing the Weathering Action of Water on Rocks 4
5. Breaking Down Rocks by Freezing 5
6. Demonstrating the Effect of Rainfall on Soil 6
7. Observing the Effect of Moving Water on the Earth's Surface 7

Student Evaluation Form 9

Appendices

A. Rock and Mineral Classification Chart 11

B. Scale of Hardness Chart 12

C. Do-It-Yourself System for Classifying Rocks 13

D. Characteristics of Rocks 14

EARTH'S SURFACE

Activity 1: Collecting Rock Samples for Observation and Classification

Instructional Objective:

The student will be able to identify at least three rocks, listing some of their distinguishing characteristics on a rock classification chart. (Appendices A and D.)

Procedures:

The student will–

1. Collect specimens from an area around the school. (Some students may bring in rocks collected elsewhere in the community. Be sure rocks are native to the area and not imported.)

2. Number each specimen with a grease pencil.

3. Examine the rocks carefully, observing their characteristics.

4. Record data, acquired through observation, on the Rock Classification Chart (Appendix A).

Materials:

rocks
magnifying glasses
pens, pencils, grease pencil
hammer, goggles
Rock Classification Chart (Appendix A)
books on rocks – Peterson: *Field Guide to Rocks and Minerals*
Zim: *Rocks and Minerals*

Note:

Teacher should supervise breaking of rocks, making certain that students are wearing goggles and observing other safety precautions.

Activity 2: Testing Rocks for Hardness

Instructional Objective:

The student will be able to test at least three rocks for hardness by using the Scale of Hardness Chart (Appendix B).

Procedures:

The student will–

1. Use the same rocks used in Activity 1.
2. Test the rocks for hardness by scratching the materials as indicated on the Scale of Hardness Chart (Appendix B).
3. Record the data on the Scale of Hardness Chart.

Materials:

rocks
pens, pencils
Scale of Hardness Chart

Activity 3: Classifying Rocks

Instructional Objective:

The student will arrange the rocks in an arbitrary order according to its stated characteristics.

Procedures:

The student will –

1. Set up a chart similar to the one illustrated in Appendix C.

2. Using the same rocks collected for Activity 1, divide the rocks into two piles according to a predetermined category such as color, size, shape, etc. Record this information on the chart.

3. Divide each of the two piles into two more piles according to a specific category, as on the chart.

4. Continue this subdividing and categorizing until the subdividing reduces each pile of rocks to one rock. When the ordering is completed, the student will have identified different characteristics of each rock. These characteristics can be used to give arbitrary names to the rocks, using the Classification Column on the right hand side of the chart, if these seem desirable.

5. Based on this do-it-yourself rock classification chart, the student should be able to collect additional rocks fom the same area where he collected the original pile and place them in the arbitrary categories established.

Materials:

Classification Chart
rocks
pencil, paper

Activity 4: Observing the Weathering Action of Water on Rocks

Instructional Objective:

The student will be able to demonstrate the weathering action of water on rocks.

Procedures:

The student will –

1. Break up a rock (taking precautions noted for Activity 1).
2. Place some rock fragments in a plastic container partly filled with water.
3. Shake the jar fifty times.
4. Remove some fragments from the jar and compare them with some not shaken (weathered).
5. Using mesh cloth or filter paper, filter the water and examine the residue with a magnifying glass.
6. Compare this activity with the effect of weathering action on rocks.

Materials:

rocks
plastic container with lid
fine mesh cloth or filter paper
magnifying glass

Activity 5: Breaking Down Rocks by Freezing

Instructional Objective:

The student will be able to demonstrate how the expansion of freezing water breaks down rocks.

Procedures:

The student will –

1. Fill a can with water so that the surface of the water is level with the top of the can.
2. Place the can in a freezer or the freezing compartment of a refrigerator. (If the weather is cold enough, place the can outside until it freezes.)
3. Observe what happens when the water becomes ice, and discuss what would happen if the water were sealed in the container.
4. Apply this information to what happens when water runs into cracks in rocks and then freezes.
5. If there is rocky terrain in the vicinity of the school, observe the rocks, looking for signs of breakdown due to the freezing of water in cracks in the rocks.

Materials:

empty can with the top removed, or cardboard milk carton
freezer or refrigerator
water

Activity 6: Demonstrating the Effect of Rainfall on Soil

Instructional Objective:

The student will be able to demonstrate the effect of rainfall on soil.

Procedures:

The student will –

1. Pile up earth and small stones into a mound approximately 1½ feet high and 2 feet wide in an open spot outdoors.

2. Using a watering can (or large tin can with fine holes punched in the bottom), fill the can with water, let it drip on the mound, and observe the results.

3. Repeat several times, each time observing the results of the "rainfall."

4. Look for erosion, gullies, pebbles washed away, and other such effects after a rainfall on the school grounds.

Materials:

pile of loose dirt
small stones
watering can and water

Activity 7: Observing the Effect of Moving Water on the Earth's Surface

Instructional Objective:

The student will observe one effect that moving water has on the earth's surface, by comparing rock samples found in and along a river or stream with those found elsewhere (e.g., the school grounds).

Procedures:

1. Take students on a field trip to a stream or river to collect rock samples, and mark those found in the water or along the bank to differentiate them from those found elsewhere. If there is other evidence of the force of moving water on this environment, elicit some ideas from the students by asking questions such as: What caused the build-up of materials from this log? Why are only small rocks found in one place and larger ones in another?

2. Have the students compare the rock samples by observing them (with and without magnifying glasses) and by feeling them.

3. Ask such questions as:

   a) Do all the rocks feel the same?
   b) Do some have sharper edges than others?
   c) What caused some rocks to lose their sharp edges?
   d) Where did the material go that was worn away?

4. Use answers to draw the conclusion that moving water wears away rocks and changes the the earth's surface.

Materials:

grease pencil
magnifying glasses
pencil, paper

STUDENT EVALUATION SHEET

Student's Name_____

		Observed	Not Observed
1.	Collects rock samples for observation and classification	_____	_____
2.	Tests rocks for hardness	_____	_____
3.	Classifies rocks	_____	_____
4.	Observes the weathering action of water on rocks	_____	_____
5.	Breaks down rocks by freezing	_____	_____
6.	Demonstrates the effect of rainfall on soil	_____	_____
7.	Observes the effect of moving water on the earth's surface	_____	_____

Appendix A

ROCK AND MINERAL CLASSIFICATION CHART

	1	2	3	4	5	6	7	8
Specimen Number	Layered or not layered	Outside color	Inside color	Texture (fine, coarse, very coarse, crystalline)	Hardness 1-10 scale	Abundance (few, some, many)	Uniform or not uniform in composition	Mineral or type of rock

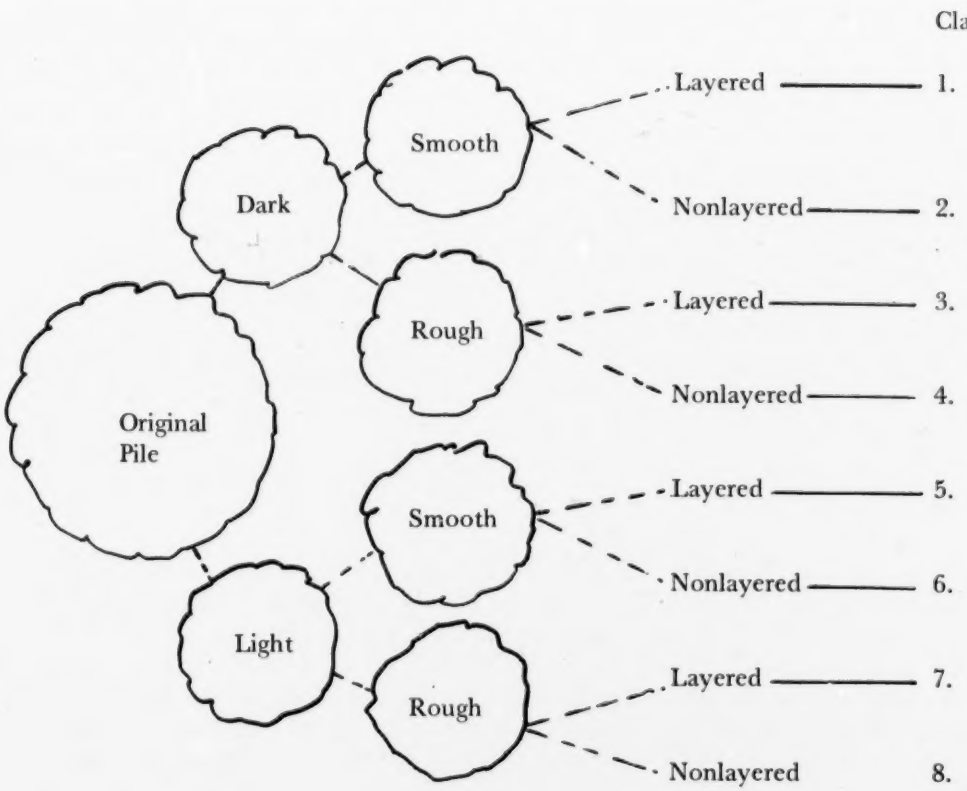
Appendix B

SCALE OF HARDNESS CHART

	1	2	3	4	5	6	7	8	9	10	
Specimen Number	Talc	Gypsum	Calcite	Fluorite	Apatite	Feldspar	Quartz	Topaz	Corundum	Diamond	
	Scratches easily with fingernail. Feels soft and slippery.	Scratches less easily with fingernail. Does not feel soft and slippery.	Scratches with piece of copper.	Scratches easily with knife.	Barely scratches with knife. Will not scratch glass.	Doesn't scratch with knife. Will scratch glass but not easily.	Scratches glass easily.	Scratches quartz.	Scratches topaz.	Scratches ruby. Hardest of all minerals.	Mineral or type of rock.

Appendix C

DO-IT-YOURSELF CHART FOR CLASSIFYING ROCKS



Note: This categorizing is arbitrary. There are numerous combinations, and students should be encouraged to develop their own ideas.

APPENDIX D

CHARACTERISTICS OF ROCKS

1. **Hardness:** Rocks and minerals vary greatly in hardness. It is possible to scratch a specimen with the sharp edge of a harder mineral provided enough pressure is applied. Moh's scale of hardness is such that the hardest mineral is number 10 and the softest is number 1. The hardness of some of the common minerals is as follows:

Hardness	Mineral
1	Talc
2	Gypsum
3	Calcite
4	Fluorite
5	Apatite
6	Orthoclase (Feldspar)
7	Quartz
8	Topaz
9	Corundum
10	Diamond

2. **Color:** The color of rocks or minerals is due to the light reflecting from the specimen to the eye. Some may have several colors (fluorite, quartz, granite, calcite, orthoclase, chert or flint, bauxite, and kaolin). Some rocks are composed of 20 or more different kinds of rocks and minerals.

3. **Luster:** The luster of rocks or minerals depends upon its composition and the quality and intensity of the light which is relected from its surface. Many terms are used to describe luster as *metallic, nonmetallic, vitreous (glass), silky, pearly, dull or earthy, resinous, greasy, and adamantine* (brilliant).

4. **Streak:** Streak is the color of the mark a specimen makes when it is rubbed across a porcelain or streak plate. The streak usually agrees with the color of the specimen but not always.

5. **Cleavage:** The tendency that some minerals have to break along smooth planes in definite directions is called *cleavage.* Some minerals have as many as six cleavage planes while other minerals have no cleavage.

6. **Fracture:** When specimens having no cleavage are broken, the break is irregular and is called a *fracture.* Some fractures tend to have surfaces that are irregularly curved in or out. A fracture of this type is called a *conchoidal.*

7. **Weight:** The specific gravity of a rock or mineral is its weight compared with n equal volume of water. Quartz is considered to have an average specific gravity for minerals.

8. **Crystal form:** When pure, most rocks or minerals will crystallize into definite forms. These forms follow certain geometric arranements. Crystals are easy to recognize, but care should be exerted to not confuse cleavage with crystal forms.